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Dorsal/Ventral asymmetric expression of nodal in the early sea urchin embryo relies on specific suppression in dorsal cells by the Hbox12 homeodomain-containing regulator

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Dorsal/Ventral (DV) polarization of the sea urchin embryo is directed by a Nodal-expressing signaling centre located on the ventral side. The initial breaking of the symmetry and positioning of the organizer are unclear. We show that, in *Paracentrotus lividus* embryos, the Hbox12 homeodomain-containing repressor is expressed on the opposite side and precedes the onset of nodal transcription. Hbox12 misexpression provokes DV abnormalities, attenuating nodal and nodal-dependent gene transcription. Reciprocally, clonal hbox12 loss-of-function imposed by blastomere transplantation or gene transfer assays disrupts DV polarization and allows ectopic expression of nodal. Remarkably, the localized knock-down of nodal restores DV polarity of embryos lacking hbox12 function. Finally, we show that Hbox12 is a dorsal-specific negative modulator of the p38 MAPK activity, which is known to be required for nodal expression. Altogether, our results indicate that hbox12 functions at the top of the symmetry-breaking sequence of events within the rising DV gene regulatory network.

Keywords: Patterning expression during embryogenesis, Dorsal/ventral gene regulatory network, Homeodomain negative regulator, Blastomere transplantation